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Computer Science 260: Quiz 1

| P | Q | P ⇒ Q |
|---|---|---|
| T | T | T |
| T | F | F |
| F | F | T |
| F | T | T |

1. The only assignment making $P \Rightarrow Q$ is false if

$\boxed{P = T \wedge Q = F}$ ✓

2. In conjunctions of literals, all parentheses can be dropped because $\wedge$ is $\boxed{\text{Associative}}$. ✓

3. In a formal proof, the law of cases allows you to conclude $B$ if you have $A \Rightarrow B$ and $\neg A \Rightarrow B$. If you have, as part of a formal proof

3. $P \wedge R \Rightarrow \forall x R(x)$
4. $\neg(P \wedge R) \Rightarrow \forall x R(x)$

then you are allowed to conclude

5. $\boxed{\forall x\, R(x)}$ ✓

Here, $A$ in the rule above unifies with $\boxed{P \wedge R}$ ✓, and $B$ with $\boxed{\forall x\, R(x)}$. ✓

4. In the list [23, a, 15, b], the head is $\boxed{23}$ ✓, and the tail is $\boxed{[a, 15, b]}$. ✓

5. Consider the following rule
abc(A,a,B) :- foo(A,B), gee(b), fum(X, A).
This rule, after unifying the head with the goal abc(b,a,a) becomes

$\boxed{\text{foo}(b, a), \text{gee}(\cancel{b}\,\text{new}), \text{fum}(X, b)}$ ✗ ½

6. If you use complete induction to prove that for all $n \geq 0$,

$$(a+b)^n = \sum_{k=0}^{n} \frac{n!}{(n-k)!k!} a^k b^{n-k},$$

you must first prove that for $n = 1$, you have

$$(a+b) = \sum_{k=0}^{1} \frac{(1)!}{(1-k)!\,k!} a^k b^{1-k}$$ ✓

Also, you must prove that the formula holds for $n+1$, that is, you would have to prove

$$(a+b)^{n+1} = \sum_{k=0}^{n+1} \frac{(n+1)!}{(n+1-k)!\,k!} a^k b^{n+1-k}$$ ✓

Note: only state the formula for 1 and $n+1$.

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